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Chevron Environmental Management Company

2013 Work Plan for Additional Assessment - Revised

Former Chevron Facility 91785
321 Elm Street
Toppenish, Washington

USEPA ID No. 4260088

April 29, 2013

ARCADIS

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ARCADIS

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ARCADIS	ARCADIS U.S., Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene and xylenes
Chevron	Chevron Environmental Management Company
COPC	constituent of potential concern
cy	cubic yards
GCL	groundwater cleanup level
mg/kg	milligrams per kilogram
MTCA SCL	Model Toxics Control Act Soil Cleanup Level
NWTPH-Dx	Northwest Total Petroleum Hydrocarbons – diesel
NWTPH-Gx	Northwest Total Petroleum Hydrocarbons – gasoline
NWTPH-HO	Northwest Total Petroleum Hydrocarbons – heavy oil
PID	photo ionization detector
site	former Chevron Facility 91785 located at 321 Elm Street in Toppenish, Washington
TPH-D	total petroleum hydrocarbons-diesel range
TPH-G	total petroleum hydrocarbons-gasoline range
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
work plan	2011 Work Plan for Additional Assessment
µg/L	micrograms per liter

1. Introduction

On behalf of Chevron Environmental Management Company (Chevron), ARCADIS U.S., Inc. (ARCADIS) has prepared this 2013 Work Plan for Additional Assessment (work plan) for the former Chevron Facility 91785 located at 321 Elm Street in Toppenish, Washington (site). The site is located on the Yakima Indian Reservation. The site and surrounding area are shown on **Figures 1** and **2**. This work plan outlines the procedures that will be used to complete the site assessment activities, including installation of monitoring wells. This work plan was prepared based on the results of the 2012 assessment activities and United States Environmental Protection Agency (USEPA) request for additional delineation at the site. Additional data will be collected to facilitate a decision regarding cleanup of the site. The delineation will define the extent of impacts to the west and confirm groundwater results from the 2012 assessment, near the southern dispensers and underground storage tanks (USTs). Additional delineation will also evaluate the groundwater conditions to the north/upgradient of the impacts detected in borings B-2-W and B-3-W in 2012.

This work plan summarizes the installation of four groundwater monitoring wells to a depth of approximately 20 feet below ground surface (bgs) at the site.

2. Site Description and Background

The site comprises an approximate 0.98-acre, rectangular-shaped parcel located at the intersection of West First Street and South Elm Street. The surrounding area consists mainly of commercial development along South Elm Street.

The site is currently an operating Texaco-branded retail petroleum service station and convenience store owned by Gary and Karen Young. According to historical reports, Chevron operated the site as a service station until 1995. Three gasoline underground storage tanks (USTs) associated pump islands, product lines, three hoists and an oil/ water separator were removed from the site in 1995. The existing service station facilities were constructed in 1997.

The former service station building is located in the central portion of the site. The USTs and pump islands were located in the southern portion of the site. A Site Plan showing the former and existing facility layouts is presented on **Figure 2**.

3. Site Geology and Hydrogeology

The site is situated in Toppenish Creek basin on the eastern slope of the Cascade Range in south-central Washington. The Toppenish Creek Basin is the northernmost of three major river basins in the Yakima Indian Reservation. Elevations in this basin range from 5,100 feet in the mountains on the western drainage divide, to 750 feet on the eastern valley floor. The topography is dominated by east-west-trending valleys and rounded ridges cut by streams. The Ahtanum and Toppenish ridges form the basin's northern and southern boundaries, respectively.

The Toppenish Creek Basin is delineated by three principal hydraulic units: young valley fill, old valley fill and basalt. The young valley fill unit includes the upper part of the Ellensburg Formation and alluvium, which consists of silty sand, gravel and cemented gravel. The old valley fill unit comprises mostly silt, sand, gravel and clay. The basalt unit is layered in a sequence of lavas that underlie the entire Toppenish Creek Basin.

The hydrology of the Toppenish Creek Basin comprises multiple aquifers and surface and groundwater interactions (U.S. Geological Survey 1987).

Soil at the site generally comprises dense silty sand with gravel to a total depth explored of 18.5 feet bgs. The depth to groundwater at the site is approximately 11 to 14 feet bgs based on historical groundwater elevations collected from former monitoring wells MW-1 through MW-5. However, the irrigation season in the Toppenish valley begins in April and runs through October. During these months, groundwater depths may fluctuate 5 to 7 feet in response to the irrigation recharge. The lowest levels occur in late March and the highest levels occurring in late summer. Groundwater flow direction at the site is to the southeast.

4. Groundwater and Soil Assessment Summary

Evidence of a release at the site was discovered in 1991 during a site assessment. In 1991, five groundwater monitoring wells (MW-1 through MW-5) were installed as part of a groundwater monitoring program. Routine groundwater monitoring was performed at the site from 1991 to 1997. Concentrations of total petroleum hydrocarbons as gasoline (TPH-G), total petroleum hydrocarbons as diesel (TPH-D) and benzene were detected exceeding groundwater cleanup levels (GCLs) in well MW-2. Benzene was also detected above the GCL in historical groundwater samples from wells MW-3 and MW-4. Concentrations of TPH-G, TPH-D, and benzene, toluene, ethylbenzene and xylenes (BTEX) were not detected above GCLs after 1995. Wells MW-1, MW-3, MW-4 and MW-5 were abandoned in March 1997 (USEPA 1998).

In May 1995, the product USTs, used oil UST and heating oil UST were removed. Additionally, three hoists, an oil/water separator, pump islands and associated piping were removed. Approximately 300 cubic yards (cy) of soil was excavated from the former UST location and transported off site. Soil analytical results indicated that the excavation was successful in removing the impacted soil, with the exception of an area near the former gasoline USTs at 13 feet bgs near MW-2. An air sparge system was installed in MW-2 in February 1997. Well MW-2 was destroyed in 1997 during additional source removal.

During site redevelopment in 1997, an additional 1,491 cy of petroleum-impacted soil was excavated and transported off site for disposal. One in-situ soil sample, collected 13½ feet from the south sidewall of the excavation, had concentrations of TPH-G, ethylbenzene and xylenes above the Model Toxics Control Act Soil Cleanup Level (MTCA SCL). One additional soil sample, collected at 16 feet bgs from the base of the excavation, had TPH-G concentrations above the MTCA SCL (PACIFIC 1997).

In April 1998, an additional site assessment was conducted to access the extent of impacted soil at the site. Four soil borings (P-1 through P-4) were advanced and soil and groundwater samples were collected from the borings. Concentrations of TPH-G, TPH-D, TPH-HO and BTEX detected in the soil samples were below MTCA Method A SGLs. Three of the four groundwater samples collected had concentrations of TPH-G, TPH-D, TPH-HO, and BTEX above the GCLs, with the highest concentration in boring P-3, which is located closest to well MW-2. Groundwater samples were collected directly from the borehole. Historical soil and groundwater data are shown in **Tables 1** and **2**, respectively (PACIFIC 1998).

In June 2012, three soil borings (B-1 through B-3) and three temporary monitoring wells (B-1-W through B-3-W) were advanced and installed to further characterize the hydrocarbon impacts at the site to a depth of 20 feet bgs. The three soil borings (B-1 through B-3) were advanced in the southern portion of the site near the pump islands and the UST pits; in areas adjacent to the highest historical petroleum impacts Soil boring locations are shown on **Figure 2**.

The soil samples collected from B-2 and B-3 contained one or more constituents of potential concern (COPCs) at concentrations greater than the MTCA CULs. The impacts were found at a depth of 12.5 feet , 15 feet, 17.5 feet and 19.5 feet bgs from boring B-2; depths of 12 feet, and 15 feet bgs to 17.5 feet bgs from sample B-3. The samples collected at depths greater than 14 feet bgs are located in the saturated zone. The soil samples collected from B-1 did not contain concentrations greater than the MTCA CULs.

Groundwater samples collected from B-2 (B-2-W) and B-3 (B-3-W) contained one or more COPCs at concentrations greater than the MTCA CULs.

5. Constituents of Potential Concern

COPCs for this site and their associated MTCA clean up levels for soil and groundwater, as well as their applicable laboratory analysis method and laboratory detection limits, are presented in the table below.

COPC	SCL (mg/kg)	GCL (µg/L)	Laboratory Method
TPH-G	100	800/1,000	NWTPH-Gx
TPH-D	2,000	500	NWTPH-Dx
TPH-heavy oil	2,000	500	NWTPH-HO
Benzene	0.03	5.0	USEPA Method 8021B
Ethylbenzene	6	700	USEPA Method 8021B
Toluene	7	1,000	USEPA Method 8021B
Total xylenes	9	1,000	USEPA Method 8021B

Notes:

mg/kg = milligrams per kilogram

NWTPH-Dx = Northwest Total Petroleum Hydrocarbons – diesel

NWTPH-Gx = Northwest Total Petroleum Hydrocarbons – gasoline

NWTPH-HO = Northwest Total Petroleum Hydrocarbons – heavy oil

µg/L = micrograms per liter

Proposed Site Assessment Activities

To further characterize the remaining hydrocarbon impacts at the site, ARCADIS proposes to install up to four groundwater monitoring wells (MW-6 through MW-9) to an approximate depth of 20 feet bgs. The locations of the borings are based on historical soil and groundwater data.

- Monitoring well MW-6 will be advanced to define extent of groundwater impacts to the west.
- Monitoring well MW-7 will be installed to confirm results the 2012 groundwater results in B-2-W.
- Monitoring well MW-8 will be installed to confirm the results of the former UST excavation sidewall samples collected in July 1997 and 2012 groundwater results in B-3-W.
- Monitoring well MW-9 will be installed to evaluate the groundwater conditions to the north/upgradient of the impacts detected in borings B-2-W and B-3-W in 2012.

The proposed locations of the groundwater monitoring wells are shown on **Figure 2**.

5.1 Access and Permitting

ARCADIS will obtain the necessary permits the Yakima Nation Water Code for the installation of groundwater monitoring wells prior to performing work on site.

5.2 Utility Clearance

ARCADIS will contact One-Call Utility Location Service to identify public underground utilities at the planned boring locations. ARCADIS will also subcontract a utility location service to locate private building utilities (e.g., electrical lines, irrigation sumps, security and electronic cables). ARCADIS staff will conduct a visual inspection of the site to identify potential utility lines. This way, ARCADIS will establish three lines of evidence of utility location prior to implementing any subsurface intrusion activities (e.g., drilling).

5.3 Soil Boring/ Monitoring Well Installation

Four soil borings (MW-6 through MW-9) will be advanced to a depth of 20 feet bgs at the locations shown on **Figure 2**. The exact soil boring locations may change based on site access or field observations. If the proposed boring locations are altered, the USEPA will be notified prior to advancing the borings. A soil vacuum truck and/or a hand auger will be used at each borehole to clear soil from ground surface to 8 feet bgs to reduce the potential for striking underground improvements. The soil will be screened and classified every 2 feet. At 2-foot intervals the vacuum truck will be stopped and a hand auger will be advanced an additional 2 feet to collect an undisturbed soil sample. The borings will then be advanced to the stated depth by a truck-mounted hollow-stem auger, as described in the attached Standard Operating Procedure (**Appendix A**).

During soil boring advancement, soil samples will be collected using split spoon samplers for lithologic description and screening at 2 foot intervals until groundwater is encountered. Once groundwater is encountered, soil samples will be collected every 5 feet to the bottom of the boring (20 feet bgs). The soil samples will be placed in laboratory-provided jars and stored in an ice-chilled cooler prior to delivery to a Washington State-accredited analytical laboratory. Up to four soil samples will be submitted from each boring for laboratory analysis.

Upon reaching the desired total depth of the borehole, a groundwater monitoring well will be installed. Each well will be constructed of dedicated 2-inch-diameter, Schedule 40 polyvinyl chloride casing with a slot size of 0.02 inch. A sand pack using 10-20 silica sand will be placed around the screened interval. The screened interval will be set based on field observations of the water table during drilling. The 10 foot screen will be set to anticipate groundwater seasonal fluctuations of approximately 5 to 7 feet, to ensure the screen will intercept the water table throughout the year. The sand pack will be placed from the bottom of the borehole to approximately one foot above the screened interval. The sand pack will be followed by hydrated bentonite chips and at least two feet of a bentonite-cement seal. The wells will be fitted with sealing and locking well caps and traffic-rated well boxes will be installed at the surface to provide secure wellheads. The actual depth and well construction details may be modified slightly based on field observations. Any deviations will be communicated by field staff to the ARCADIS project manager or project engineer and USEPA project manager immediately.

5.3.1 Field Screening

Field screening of soil samples will be performed continuously during boring activities using a photo ionization detector (PID) and through visual observation. Soil from each hand auger and split spoon sampler will be placed into a sealable plastic bag and allowed to volatilize for at least 10 minutes, but no more than 60 minutes. A PID will then be inserted into a small opening of the plastic bag and used to read the concentration of volatile organic compounds (VOCs) in the bag. The VOC reading will be recorded on soil boring logs and field sheets used to document drilling activities. Field screening will also include a visual inspection of soil for the presence of light nonaqueous phase liquid (LNAPL), hydrocarbon odor or hydrocarbon sheen on the soil or groundwater. Lithology descriptions and classifications of soil will be conducted by trained ARCADIS field staff, recorded on boring logs and included in completion reports.

5.3.2 Monitoring Well Development and Surveying

Well development will proceed a minimum 24 hours after completion of the new well, thus allowing for the annular seal material to set or cure. Well development will be performed by surging the wells over the length of the screen interval using a bailer or surge block and purging the well until the water is relatively free of suspended sediments and/or until approximately 10 well volumes have been removed. Purging will be completed using down-hole pumps and purge water will be containerized in DOT-approved 55-gallon drums and sampled for disposal.

Upon completion of the well installation, the well will be surveyed by a licensed surveyor. The well location will be surveyed relative to site features and local datum, and the top of casing elevations will be measured from a permanent measuring point installed on the casing.

5.4 Sample Analysis

Up to four soil samples will be collected and submitted for laboratory analysis from each boring. One soil sample will be collected at the same depth as previous encountered impacts (13 to 16 feet bgs). A second sample will be collected from the interval with the highest PID reading, as indicated by field screening methods, and a third sample will be collected from the bottom of the boring. A fourth soil sample may be collected if field screening methods indicate the presence of petroleum hydrocarbons.

Soil and groundwater samples will be submitted to Lancaster Laboratory Inc., of Lancaster, Pennsylvania, a Washington State Department of Ecology-certified laboratory for analysis. Chain of custody procedures will be followed from the time the samples are collected until the time the samples are relinquished to the laboratory. The samples will be submitted for the following analyses:

- TPH-G by NWTPH-Gx
- TPH-D and TPH-HO by NWTPH-Dx
- TPH-D by NWTPH-Dx with silica gel cleanup procedures
- BTEX by USEPA Method 8021B using methanol preservation according to Method 5035.

5.5 Soil and Groundwater Quality Control Measures

Analytical soil samples will be placed directly into clean, laboratory-supplied containers and preserved specific to the analysis to be performed. The containers will be tarred, 4-ounce or larger jars with a Teflon®-lined septum fused to the lid.

Sample containers will be properly labeled to include the date, time, location and depth of the sample collection and immediately stored in an iced cooler, kept at a temperature of 2 to 6 degrees Celsius. The samples will be retained at this temperature and accompanied by the chain-of-custody through delivery to the laboratory.

Soil will only come into contact with properly decontaminated or disposable materials and handling of the soil will be kept at a minimum to prevent volatilization or possible cross contamination. Soil placed into sealable plastic bags for field screening will not be submitted as analytical samples. Collected samples will be documented on field boring logs and in field note documents.

Groundwater samples will be collected at a minimum of 24 hours following the completion of well development. Groundwater samples will be collected using low flow sampling procedures included in the USEPA Low Stress (low flow) Purging and

Sampling Procedures. This technique allows groundwater samples to be collected with minimal alterations to the water chemistry (USEPA 1996). The groundwater samples will be placed in the appropriate laboratory-provided bottles and stored in an ice-chilled cooler prior to delivery to the laboratory.

Duplicate samples will be collected concurrently with field samples for soil and groundwater at a ratio of one blind duplicate sample for every 10 field samples.

Deviations to the sampling plan will be communicated by field staff to the ARCADIS project manager and the USEPA, as necessary, prior to modifying the approved plan.

During soil boring activities, detailed boring logs will be kept for each boring and will include date of activities, drilling and sampling methods, borehole depth and size, lithology descriptions, samples collected, soil headspace readings, and static water levels. Field documentation will be included with the completion report upon project completion.

5.6 Investigative-Derived Waste Management

Soil cuttings and wastewater generated during the field activities will be contained in Department of Transportation-approved 55-gallon steel drums. These drums will be appropriately labeled and temporarily stored on site pending analytical results. Upon receipt of soil analytical results, the drums will be removed from the site and transported to a Chevron-approved off-site disposal facility.

6. Field Documentation

ARCADIS field staff will maintain detailed documentation of field activities. This includes the date of activities, weather conditions, sampling team members, instrument calibration documentation, location of activity, site conditions, field observations, changes to sampling protocol, site sketches and communication with project team members.

7. Reporting

A report will be prepared after completion of the proposed activities and receipt of final analytical data. The report will summarize the field activities, soil boring logs and laboratory analytical data.

8. References

Pacific Environmental Group, Inc. (PACIFIC) 1996. Quarterly Monitoring and Sampling Activities Former Chevron Service Station 9-1785. April 19, 1996.

Pacific Environmental Group, Inc. (PACIFIC) 1997. Oversight of Construction Activities/Soil Remediation Former Chevron Service Station 9-1785. December 24, 1997.

Pacific Environmental Group, Inc. (PACIFIC) 1998. Environmental Assessment Former Chevron Service Station 9-1785. April 22, 1998.

United States Environmental Protection Agency (USEPA). 1996. Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells. July 30, 1996.

United States Environmental Protection Agency (USEPA). 1997. OW137 Response to Request for Information Former Chevron Service Station #9-1785. November 3, 1997.

U.S. Geological Survey. 1987. Groundwater Hydrology of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.

Tables

TABLE 1

Historical Soil Analytical Data
Former Chevron Facility 91785
321 South Elm Street
Toppenish, Washington

Location	Sample Depth/ Interval	Sample Date	TPH-G	TPH-D	TPH-HO	Benzene	Toluene	Ethylbenzene	Total Xylenes
MTCA Method A Soil Cleanup Levels			**100**	**2,000**	**2,000**	**0.3**	**7**	**6**	**9**
NSW-13.5	13.5	07/30/97	ND	ND	--	ND	ND	ND	ND
SSW-7	7	07/30/97	ND	11	--	ND	ND	ND	ND
SSW-10	10	07/30/97	9.41	25.3	NA	ND	ND	ND	ND
SSW-13.5	13.5	07/30/97	**4,860**	204	NA	ND	5.19	**249**	**13**
ESW-13.5	13.5	07/30/97	ND	10.6	NA	ND	ND	ND	ND
WSW - 13.5	13.5	07/30/97	ND	ND	NA	ND	ND	ND	ND
SBF-16	16	07/30/97	**162**	157	NA	ND	0.0968	ND	5.48
NBF-16	16	07/30/97	ND	12.5	NA	ND	ND	ND	ND
F1WSW-12	12	08/14/97	ND	ND	61.2	ND	ND	ND	ND
F2-12	12	08/14/97	ND	ND	ND	ND	ND	ND	ND
F3-12	12	08/14/97	ND	ND	ND	ND	ND	ND	ND
F4-12	12	08/14/97	ND	ND	ND	ND	ND	ND	ND
F5-12	12	08/14/97	ND	ND	ND	ND	ND	ND	ND
P-1-12	12	01/29/98	1.36	ND	29.5	ND	ND	ND	ND
P-2-12.6	12.6	01/29/98	ND	ND	ND	ND	ND	ND	ND
P-3-12	12	01/29/98	ND	ND	26.7	ND	ND	ND	ND
P-4-13	13	01/29/98	ND	ND	67.5	ND	ND	ND	ND
B-1-4	4	6/11/2012	<1.4	<3.5	<12	<0.0027	0.021	0.0047	0.019
B-1-6	6	6/11/2012	<1.1	4.2	68	<0.0022	0.023	0.0056	0.027
B-1-8	8	6/12/2012	<1.7	6.9	130	<0.0034	0.013	0.0063	0.039
B-1-20	20	6/12/2012	<1.2	<3.5	<12	<0.0025	0.068	0.012	0.046
B-2-12.5	12.5	6/12/2012	240	<3.3	<11	<0.35	2.7	2.8	16
B-2-15	15	6/12/2012	290	<3.4	<11	<0.33	2.4	3	17
B-2-17.5	17.5	6/12/2012	59	<3.9	<13	0.02	1	0.69	3.9
B-2-19.5	19.5	6/12/2012	110	<3.7	<13	0.055	0.66	0.77	4.4
Dup-1	19.5	6/12/2012	30	<3.5	<12	0.019	0.18	0.23	1.4
B-3-2	2	6/12/2012	<1.1	5.9	58	<0.0022	0.032	0.0098	0.035
B-3-6	6	6/12/2012	<1.3	<3.6	<12	<0.0026	0.031	0.0064	0.033
B-3-12	12	6/12/2012	1,400	18	<12	0.54	38	20	130
B-3-15	15	6/12/2012	2,300	16	<12	1.8	77	34	200
B-3-17.5	17.5	6/12/2012	160	<3.5	<12	0.13	4.8	2.1	13

Notes:

All results are reported in milligrams per kilogram (mg/kg).

TPH-G was analyzed by NWTPH-Gx.

TPH-D was analyzed by NWTPH-Dx.

TPH-HO was analyzed by NWTPH-HO

Benzene, toluene, ethylbenzene, and total xylenes (BTEX) analyzed by EPA Method 8260B or EPA Method 8021B.

Highlighted cell indicates concentration exceeds respective soil cleanup level.
-- = not applicable/not available.

< = not detected greater than the laboratory reporting limit indicated.

TABLE 2

Historical Groundwater Analytical Data
Former Chevron Facility 91785
321 South Elm Street
Toppenish, Washington

Location	Sample Date	TPH-G	TPH-D	TPH-HO	Lead	Benzene	Toluene	Ethylbenzene	Total Xylenes
MTCA Method A Groundwater Cleanup Levels		**800**	**500**	**500**	**15**	**5**	**1,000**	**700**	**1,000**
MW-1	05/28/91	ND	**760**	--	1.6	ND	ND	ND	ND
	04/07/92	ND	ND	--	21	ND	ND	ND	ND
	07/08/92	ND	ND	--	2.4	ND	ND	ND	ND
	10/19/92	ND	ND	--	4.7	ND	ND	ND	ND
	03/23/93	ND	ND	--	ND	ND	ND	ND	ND
	06/24/93	ND	ND	--	ND	ND	ND	ND	ND
	09/02/93	ND	ND	--	ND	ND	ND	ND	ND
	12/08/93	ND	ND	--	ND	ND	ND	ND	ND
	03/16/94	--	--	--	--	--	--	--	--
	06/15/94	--	--	--	--	--	--	--	--
	09/01/94	--	--	--	--	--	--	--	--
	11/07/94	--	--	--	--	--	--	--	--
	03/01/95	--	--	--	--	--	--	--	--
	05/24/95	--	--	--	--	--	--	--	--
	08/21/95	--	--	--	--	--	--	--	--
	11/15/95	--	--	--	--	--	--	--	--
	02/28/96	--	--	--	--	--	--	--	--
Abandoned	03/13/97	--	--	--	--	--	--	--	--
MW-2	05/28/91	**3,000**	**1,600**	--	**17**	0.74	2.9	29	190.00
Duplicate	05/28/91	**3,400**	**1,800**	--	5.2	0.76	2.9	29	210.00
	04/07/92	350	ND	--	13	7	0.52	1.1	0.73
Duplicate	04/07/92	340	ND	--	7.8	7.4	0.62	1.4	1.00
	07/08/92	410	ND	--	4.1	43	30	2.5	3.10
	10/19/92	290	ND	--	2.7	5.9	21	1.6	4.40
Duplicate	10/19/92	220	ND	--	3.4	5.3	19	1.4	3.90
	03/23/93	ND	ND	--	8.6	2.4	1.1	ND	1.00
	06/24/93	ND	ND	--	ND	6.4	0.7	0.5	1.70
	09/02/93	**1,000**	ND	--	ND	130	120	23	180.00
	12/08/93	ND	ND	--	4.5	4.4	8.1	2.6	9.20
	03/16/94	ND	ND	--	--	ND	ND	ND	ND
	06/15/94	110	ND	--	--	6.9	6.9	2.7	13.00
	09/01/94	120	ND	--	--	8.3	9.7	6.3	16.00
	11/07/94	200	ND	--	--	7.7	25	11	49.00
	03/01/95	140	ND	--	--	14.9	10	5.6	18.00
	05/24/95	160	390	--	--	2	3.4	6.8	13.00
	08/21/95	**850**	**1,700**	--	--	31	0.93	ND	7.20
	11/15/95	380	ND	--	--	2	7.2	9.7	36.00
	02/28/96	--	--	--	--	--	--	--	--
	03/13/97	ND	--	--	--	ND	ND	ND	1.63
	05/15/97	58	--	--	--	ND	ND	ND	8.04
	07/08/97	288	ND	--	--	ND	0.726	8.69	30.30
MW-3	05/28/91	ND	310.0	--	4.9	ND	ND	ND	ND
	04/07/92	ND	ND	--	**82**	ND	ND	ND	ND
	07/08/92	340	ND	--	5.4	51	17	8.4	57
	10/19/92	630	ND	--	6.9	140	21	7.2	100
	03/23/93	130	300	--	ND	14	0.6	3.1	4.7
	06/24/93	ND	ND	--	ND	ND	ND	ND	ND
	09/02/93	170	ND	--	ND	17	6.8	3.4	32
	12/08/93	ND	ND	--	ND	ND	ND	ND	ND
	03/16/94	ND	ND	--	--	ND	ND	ND	ND
	06/15/94	ND	ND	--	--	ND	ND	ND	ND
	09/01/94	ND	ND	--	--	9.4	ND	ND	1
	11/07/94	330	ND	--	--	52	3.7	9.3	33
	03/01/95	ND	ND	--	--	ND	ND	ND	ND
	05/24/95	ND	ND	--	--	ND	ND	ND	ND
	08/21/95	--	--	--	--	--	--	--	--
	11/15/95	ND	ND	--	--	ND	ND	ND	ND
	02/28/96	ND	ND	--	--	ND	ND	ND	ND
Abandoned	03/13/97	--	--	--	--	--	--	--	--
MW-4	05/28/91	97	370	--	3.1	ND	ND	ND	ND
	04/07/92	ND	ND	--	8.5	9	ND	ND	ND
	07/08/92	ND	ND	--	3.8	ND	ND	ND	ND
	07/08/92	ND	ND	--	5.8	ND	ND	ND	ND
	10/19/92	ND	ND	--	7	1.5	ND	ND	ND
	03/23/93	ND	ND	--	ND	0.07	0.9	0.8	7.6
	06/24/93	ND	ND	--	ND	47	ND	ND	ND
	09/02/93	ND	ND	--	ND	ND	1.3	6.8	21
	12/08/93	ND	ND	--	ND	52	ND	ND	ND
	03/16/94	230	230	--	--	ND	ND	ND	ND
	06/15/94	ND	ND	--	--	ND	ND	ND	ND
	09/01/94	ND	ND	--	--	ND	ND	ND	ND
	11/07/94	ND	ND	--	--	ND	ND	ND	ND
	03/01/95	ND	ND	--	--	ND	ND	ND	ND
	05/24/95	--	--	--	--	--	--	--	--
	08/21/95	--	--	--	--	--	--	--	--
	11/15/95	--	--	--	--	--	--	--	--
	02/28/96	--	--	--	--	--	--	--	--
Abandoned	03/13/97	--	--	--	--	--	--	--	--
MW-5	05/28/91	ND	1,800	--	3.2	ND	ND	ND	ND
	04/07/92	ND	ND	--	12	ND	ND	ND	ND
	07/08/92	ND	ND	--	2.6	ND	ND	ND	ND
	10/19/92	ND	ND	--	4.7	ND	ND	ND	ND
	03/23/93	ND	ND	--	ND	ND	ND	ND	ND
	06/24/93	ND	ND	--	ND	ND	ND	ND	ND
	09/02/93	ND	ND	--	ND	ND	ND	ND	ND
	12/08/93	ND	ND	--	ND	ND	ND	ND	ND
	03/16/94	--	--	--	--	--	--	--	--
	06/15/94	--	--	--	--	--	--	--	--
	09/01/94	--	--	--	--	--	--	--	--
	11/07/94	--	--	--	--	--	--	--	--
	03/01/95	--	--	--	--	--	--	--	--
	05/24/95	--	--	--	--	--	--	--	--
	08/21/95	--	--	--	--	--	--	--	--
	11/15/95	--	--	--	--	--	--	--	--
	02/28/96	ND	ND	--	ND	ND	ND	ND	ND
Abandoned	03/13/97	--	--	--	--	--	--	--	--
P-1	01/29/98	**3,550**	**1,040**	**3,030**	--	**8.8**	17.5	180.0	271.00
P-2	01/29/98	**7,430**	**2,910**	ND	--	**36.4**	7.1	102.0	86.40
P-3	01/29/98	**1,680**	**6,540**	ND	--	**6.7**	1.3	19.3	15
P-4	01/29/98	ND	476	ND	--	ND	ND	ND	ND

Notes:

All results are reported in micrograms per liter (ug/l)

TPH-G was analyzed by NWTPH-Gx.

TPH-D was analyzed by NWTPH-Dx.

TPH-HO was analyzed by NWTPH-HO

Benzene, toluene, ethylbenzene, and total xylenes (BTEX) analyzed by EPA Method 8260B or EPA Method 8021B.

Lead analyzed by EPA Method 7421 (Total Lead).

Highlighted cell indicates concentration exceeds respective groundwater cleanup level.

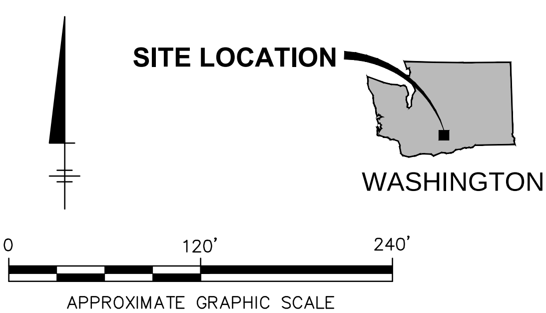
-- = not applicable/not available.

< = not detected greater than the laboratory reporting limit indicated.

ARCADIS

Figures

SOURCE: AERIAL PHOTOGRAPH PROVIDED BY GOOGLE EARTH PRO. 2010.

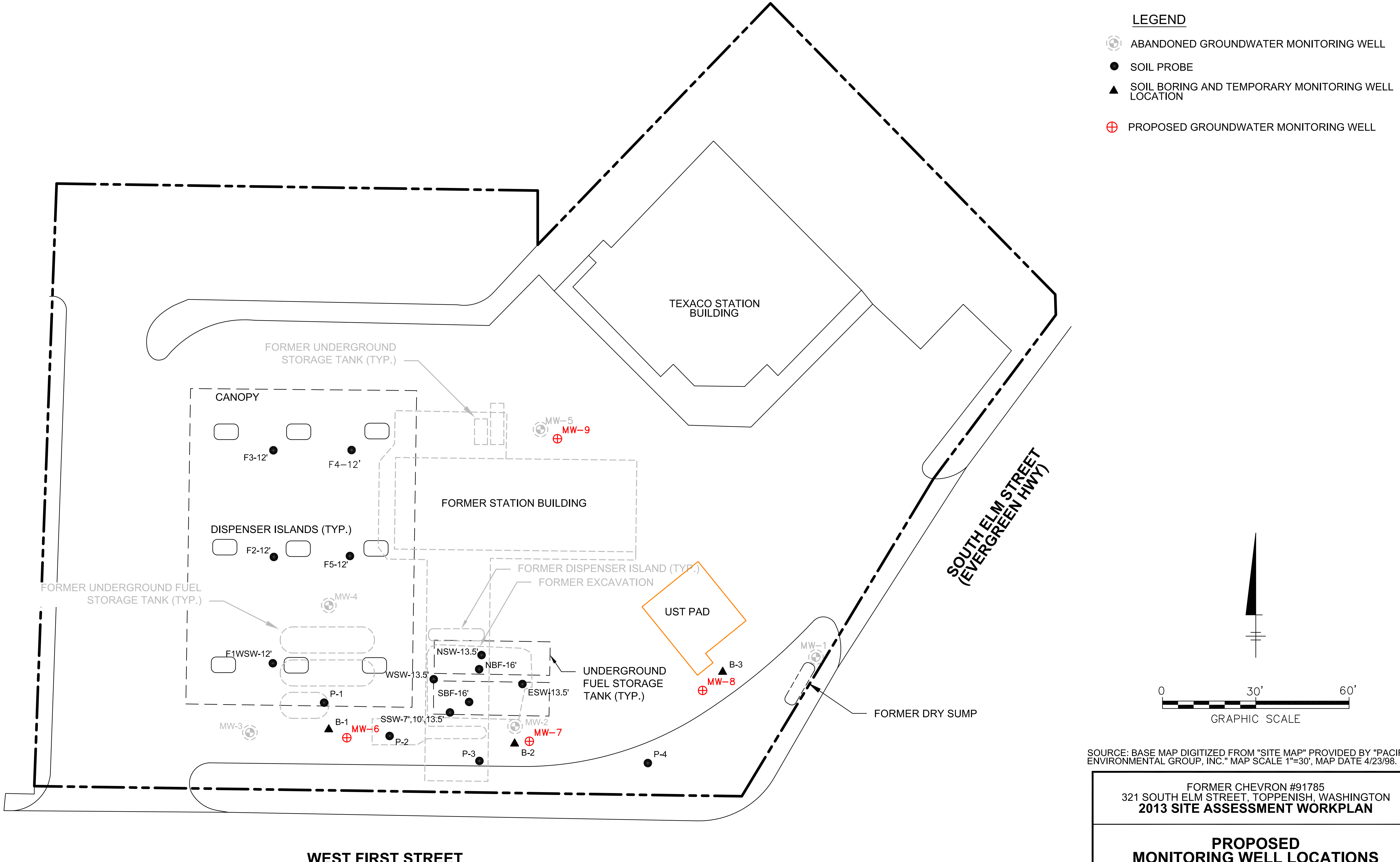


FORMER CHEVRON #91785
321 SOUTH ELM STREET, TOPPENISH, WASHINGTON
2013 SITE ASSESSMENT WORKPLAN

SITE LOCATION MAP

ARCADIS

FIGURE
1



SOURCE: BASE MAP DIGITIZED FROM "SITE MAP" PROVIDED BY "PACIFIC ENVIRONMENTAL GROUP, INC." MAP SCALE 1"=30', MAP DATE 4/23/98.

FORMER CHEVRON #91785
321 SOUTH ELM STREET, TOPPENISH, WASHINGTON
2013 SITE ASSESSMENT WORKPLAN

PROPOSED MONITORING WELL LOCATIONS

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FIGURE
2

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Appendix A

Standard Operating Procedure

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Infrastructure, environment, buildings

Imagine the result

Soil Drilling and Sample Collection

Rev. #: 2

Rev Date: March 8, 2011

Approval Signatures

Prepared by: ______________________ Date: 03/08/2011

Reviewed by: ______________________ Date: 03/08/2011
(Technical Expert)

I. Scope and Application

Overburden drilling is commonly performed using the hollow-stem auger drilling method. Other drilling methods suitable for overburden drilling, which are sometimes necessary due to site-specific geologic conditions, include: drive-and-wash, spun casing, Rotasonic, dual-rotary (Barber Rig), and fluid/mud rotary. Direct-push techniques (e.g., Geoprobe or cone penetrometer) may also be used. The drilling method to be used at a given site will be selected based on site-specific consideration of anticipated drilling depths, site or regional geologic knowledge, types of sampling to be conducted, required sample quality and volume, and cost.

No oils or grease will be used on equipment introduced into the boring (e.g., drill rod, casing, or sampling tools).

II. Personnel Qualifications

The Project Manager (a qualified geologist, environmental scientist, or engineer) will identify the appropriate soil boring locations, depth and soil sample intervals in a written plan.

Personnel responsible for overseeing drilling operations must have at least 16 hours of prior training overseeing drilling activities with an experienced geologist, environmental scientist, or engineer with at least 2 years of prior experience.

III. Equipment List

The following materials will be available during soil boring and sampling activities, as required:

- Site Plan with proposed soil boring/well locations;
- Work Plan or Field Sampling Plan (FSP), and site Health and Safety Plan (HASP);
- personal protective equipment (PPE), as required by the HASP;
- drilling equipment required by the American Society for Testing and Materials (ASTM) D 1586, when performing split-spoon sampling;
- disposable plastic liners, when drilling with direct-push equipment;
- appropriate soil sampling equipment (e.g., stainless steel spatulas, knife);

- equipment cleaning materials;
- appropriate sample containers and labels;
- chain-of-custody forms;
- insulated coolers with ice, when collecting samples requiring preservation by chilling;
- photoionization detector (PID) or flame ionization detector (FID); and
- field notebook and/or personal digital assistant (PDA).

IV. Cautions

Prior to beginning field work, underground utilities in the vicinity of the drilling areas will be identified by one of the following three actions (lines of evidence):

- Contact the State One Call
- Obtain a detailed site utility plan drawn to scale, preferably an "as-built" plan
- Conduct a detailed visual site inspection

In the event that one or more of the above lines of evidence cannot be conducted, or if the accuracy of utility location is questionable, a minimum of one additional line of evidence will be utilized as appropriate or suitable to the conditions. Examples of additional lines of evidence include but are not limited to:

- Private utility locating service
- Research of state, county or municipal utility records and maps including computer drawn maps or geographical information systems (GIS)
- Contact with the utility provider to obtain their utility location records
- Hand augering or digging
- Hydro-knife
- Air-knife
- Radio Frequency Detector (RFD)

- Ground Penetrating Radar (GPR)

- Any other method that may give ample evidence of the presence or location of subgrade utilities.

Overhead power lines also present risks and the following safe clearance must be maintained from them.

Power Line Voltage Phase to Phase (kV)	Minimum Safe Clearance (feet)
50 or below	10
Above 50 to 200	15
Above 200 to 350	20
Above 350 to 500	25
Above 500 to 750	35
Above 750 to 1,000	35

ANSI Standard B30.5-1994, 5-3.4.5

Avoid using drilling fluids or materials that could impact groundwater or soil quality, or could be incompatible with the subsurface conditions.

Water used for drilling and sampling of soil or bedrock, decontamination of drilling/sampling equipment, or grouting boreholes upon completion will be of a quality acceptable for project objectives. Testing of water supply should be considered.

Specifications of materials used for backfilling borehole will be obtained, reviewed and approved to meet project quality objectives.

V. Health and Safety Considerations

Field activities associated with overburden drilling and soil sampling will be performed in accordance with a site-specific HASP, a copy of which will be present on site during such activities.

VI. Procedure

Drilling Procedures

The drilling contractor will be responsible for obtaining accurate and representative samples; informing the supervising geologist of changes in drilling pressure; and keeping a separate general log of soils encountered, including blow counts (i.e., the number of blows from a soil sampling drive weight [140 pounds] required to drive the split-barrel sampler in 6-inch increments). The term "samples" means soil materials from particular depth intervals, whether or not portions of these materials are submitted for laboratory analysis. Records will also be kept of occurrences of premature refusal due to boulders or construction materials that may have been used as fill. Where a boring cannot be advanced to the desired depth, the boring will be abandoned and an additional boring will be advanced at an adjacent location to obtain the required sample. Where it is desirable to avoid leaving vertical connections between depth intervals, the borehole will be sealed using cement and/or bentonite. Multiple refusals may lead to a decision by the supervising geologist to abandon that sampling location.

Soil Characterization Procedures

Soils encountered while drilling soil borings will be collected using one of the following methods:

- 2-inch split-barrel (split-spoon) sampler, if using the ASTM D 1586 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils

- Plastic internal soil sample sleeves if using direct-push drilling.

Soils are typically field screened with an FID or PID at sites where volatile organic compounds are present in the subsurface. Field screening is performed using one of the following methods:

- Upon opening the sampler, the soil is split open and the PID or FID probe is placed in the opening and covered with a gloved hand. Such readings should be obtained at several locations along the length of the sample

- A portion of the collected soil is placed in a jar, which is covered with aluminum foil, sealed, and allowed to warm to room temperature. After warming, the cover is removed, the foil is pieced with the FID or PID probe, and a reading is obtained.

Samples selected for laboratory analysis will be handled, packed, and shipped in accordance with the procedures outlined in the Work Plan, FSP, or Chain-of-Custody, Handling, Packing, and Shipping SOP.

A geologist will be onsite during drilling and sampling operations to describe each soil interval on the soil boring log, including:

- percent recovery;
- structure and degree of sample disturbance;
- soil type;
- color;
- moisture condition;
- density;
- grain-size;
- consistency; and
- other observations, particularly relating to the presence of waste materials

Further details regarding geologic description of soils are presented in the Soil Description SOP.

Particular care will be taken to fully describe any sheens observed, oil saturation, staining, discoloration, evidence of chemical impacts, or unnatural materials.

VII. Waste Management

Water generated during cleaning procedures will be collected and contained onsite in appropriate containers for future analysis and appropriate disposal.

PPE (such as gloves, disposable clothing, and other disposable equipment) resulting from personnel cleaning procedures and soil sampling/handling activities will be placed in plastic bags. These bags will be transferred into appropriately labeled 55-gallon drums or a covered roll-off box for appropriate disposal.

Soil materials will be placed in sealed 55-gallon steel drums or covered roll-off boxes and stored in a secured area. Once full, the material will be analyzed to determine the appropriate disposal method.

VIII. Data Recording and Management

The supervising geologist or scientist will be responsible for documenting drilling events using a bound field notebook and/or PDA to record all relevant information in a clear and concise format. The record of drilling events will include:

- start and finish dates of drilling;
- name and location of project;
- project number, client, and site location;
- sample number and depths;
- blow counts and recovery;
- depth to water;
- type of drilling method;
- drilling equipment specifications, including the diameter of drilling tools;
- documentation of any elevated organic vapor readings;
- names of drillers, inspectors, or other people onsite; and
- weather conditions.

IX. Quality Assurance

Equipment will be cleaned prior to use onsite, between each drilling location, and prior to leaving the site. Drilling equipment and associated tools, including augers, drill rods, sampling equipment, wrenches, and other equipment or tools that may have come in contact with soils and/or waste materials will be cleaned with high-pressure steam-cleaning equipment using a potable water source. The drilling equipment will be cleaned in an area designated by the supervising engineer or geologist that is located outside of the work zone. More elaborate cleaning procedures may be required for reusable soil samplers (split-spoons) when soil samples are obtained for laboratory analysis of chemical constituents.

X. References

American Society of Testing and Materials (ASTM) D 1586 - *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils*.